Avoiding the Icebergs Ahead:
The Future of the Modern Research University

Good morning. It is a pleasure be with the members of the
National Textile Center and its industry guests and talk with you
about something that is important to me and, I believe, the entire
nation... the future of the modern research university.

I hope that when I'm finished speaking, I don't experience what
Adlai Stevenson did the time he spoke at a small college. When the
speech was over, a young man approached him and said, "Mr.
Stevenson that was a wonderful speech, absolutely superfluous."
Stevenson was taken aback, but graciously replied with tongue in
cheek, "Thank you. I'm glad you liked it. I plan to have it
published posthumously." The student then replied, "Great! The
sooner the better!"

I would suggest the future of the modern research university needs
our attention, the sooner the better, if we are to avoid that
posthumous feeling.

On first glance, it is hard to see that our situation is anything
but healthy. After all, much of America's economic strength can
be attributed to discoveries made at research universities.
Discoveries leading to the pacemaker, digital computers, space-
based weather forecasting, the Internet and jet airliners were

made in research university laboratories. In the southeastern
region of our nation, where most of the NTC activities reside,
locations where the most robust job growth occurs, and the highest
wages are found, are associated with major research universities.
To name the most obvious examples: Austin, Texas and UT at Austin;
the Research Triangle in North Carolina and Duke, UNC and NC
State; and Atlanta, Georgia and Georgia Tech and Emory. Research
universities are important, not only to their students, but also
to every citizen within their reach.

In addition to its contribution to knowledge creation, the
American research university is more popular than ever before,
with more than 2.5 million students attending those one hundred or
so institutions designated as research universities. And, it is
estimated that admissions to these same universities will be even
more sought after as the children born during the '80s baby boom
come of age.

As much as I would like to believe unlimited success is on the horizon, instead, the situation is quite different. In fact, the modern research university can draw some sobering lessons from that ill-fated ship, the Titanic, now popularized in the world's most expensive motion picture.

- Like the Titanic, we are believed to be the best in the world.

- Like the Titanic, we are believed to be unsinkable.

- Like the Titanic, there are challenges--figurative icebergs- ahead, and we are receiving warnings they are there.

  Like the Titanic, we are not doing enough to heed the warnings of the icebergs on our course.

We all know the fate of the Titanic. The unsinkable ship was vulnerable, the icebergs warnings were not taken seriously until it was too late, and she went down in less than two hours after impact, taking 1500 passengers and crew with her.

What can research universities do to take actions before our ship's collision is so imminent it is too late to avoid sinking? We need to hear the warnings clearly and understand the challenges. And,we need to alert others about the very real challenges facing us so that this precious resource will not be lost to our nation.

In a recent speech to the National Science Foundation, former chancellor of the University of California-Berkeley, Chang-Lin Tien, stated that "time is running out" for American higher education to adapt to world forces that are changing the nature of business, education, and society. He said, "American higher education is still the best in the world, but it is very needy, very stressed."

One of the principal "world forces" he spoke of is the advent of telecommunications and educational technology. Others echo his concerns in this area. Approximately a year ago, Peter Drucker said in Forbes Magazine, "Thirty years from now the big university campuses will be relics. Higher education is in deep crisis. Already we are beginning to deliver more lectures off campus via satellite or two-way video at a fraction of the cost. The college won't survive as a residential institution."

An earlier, and more thoughtful, alarm for the university was sounded by Dr. Eli Nome, Director of the Columbia Institute for Tele-Information, who said in his article, "Electronics and the Dim Future of the University," "... while new communications technologies are likely to strengthen research, they will also weaken the traditional major institutions of learning, the universities."

What is it that creates this kind of thinking? Consider the following:

Ownership of personal computers has reached 1 out of 4 homes in the U.S.; in the Atlanta metropolitan area, a recent survey showed as many as 65 percent of the households owned computers with fully 50 percent of these linked to the Internet. Ninety percent of teens report using computers frequently, and they come to education with a different mode of thinking than past generations, with more emphasis on self-learning and interactive dialog via the network. This fall, more than 10,000 potential Georgia Tech students downloaded an entrance application from the Georgia Tech website and a record number completed their application process this way.

Nationally, use of electronic course delivery is growing; it is estimated that 1 million people received courses via video and other media last year. This figure is up considerably from previous years and approaches one tenth of the number receiving courses in traditional classrooms. Phoenix University, one of the first fully virtual universities, now enrolls 40,000 students and expects to grow rapidly to 100,000.

This is impressive, but there are ample reasons to believe the potential of telecommunications technology is only beginning to emerge. In a recent address at Georgia Tech, Dr. Dan Stanzione, President of Lucent Technologies, summarized three forces that he termed as "driving a global communications revolution." The first is characterized by the now familiar Moore's Law-formulated by Gordon Moore, co-founder of Intel. This law, which has accurately predicted computing power trends for twenty years, states the number of transistors on a silicon chip will double every eighteen months to two years. Stanzione cited new developments in the chip area that assure Moore's Law would continue to apply for at least another fifteen to twenty years.

Stanzione cited two other powerful converging telecommunications technologies that are following trajectories much like that defined by Moore's Law. These are the information transmission rate on optical fibers and the capacity of wireless systems. Prototype technologies are already being demonstrated in industrial and university laboratories that guarantee an almost exponential expansion of the capacity of these systems. The expansion of wireless system capacity will also create a major reduction in cost of wireless communications.

What this means for higher education is the changes wrought to date by telecommunications and educational technology are going to accelerate rapidly in the next twenty years.

It is sobering to ask how universities will adapt to the coming revoluation in information technology --and even more disquieting when one considers normal the pace of change in a traditional university setting. Will research universities be able to adjust, or will Nome and Drucker be right? There is not much time to think about it since the race is on, and so far universities have largely been doing most of their work in the warm-up area, not on the track.

In his book, **Being Digital**, Nicholas Negroponte contrasts the case of a surgeon and a faculty lecturer from the 17th century who are both transported to the 21st century. In the operating theater of a modern hospital, the 17th century surgeon would recognize little and be unable to contribute to the surgery. But, the 17th century faculty lecturer would feel right at home in most of today's classrooms. This is not a good sign.

Unfortunately, while we try to turn our ship to find a course to deal with the startling telecommunications revolution, there are other "icebergs" ahead as well. A partial list of these would include: the near-nightmarish backlog of maintenance for our buildings and infrastructure, excessive duplication of programs from campus to campus, reliance on campus processes that cause response to change to be glacial, the sparsity of efforts to create healthy partnerships to support research, continued focus on narrow disciplinary approaches to teaching and research, lack of attention to our undergraduates, and the problems with our pipeline, the K-12 system.

So, what does this all mean for the modern research university? Should we all gather on our porches and begin to sing "Nearer My God to Thee?" Are we dinosaurs on our way to extinction? My

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answer is, not necessarily, but it will require hard work and action.

Here are some of the steps I believe we should take:

1.   We must embrace educational technology and offer more
     opportunities for self-learning. We have to do this while
     maintaining quality of our programs and degrees.

     At Georgia Tech, we have taken some of the needed steps.
     Because of the Olympics, Georgia Tech gained FutureNet, a
     network that provides high- speed voice, audio, and
     computer links to the entire campus. We have begun building
     on this strong foundation and are now requiring freshmen to
     own computers. On a basic level, this will encourage all of
     our students to e- mail their professors, conduct research
     via the web, and use their computers for basic computing
     functions. However, we plan to incorporate much more,
     including:

• Classrooms with video feed and electronic whiteboards that allow
  faculty   lectures to be directly recorded, along with
  student notes from their own   electronic pads, then
  immediately accessed by students' in-room computers.

• Multi-location design project interaction where team-to-team
  information is exchanged via electronic whiteboards and the
  Internet.

• On-demand learning offerings delivered directly to desktop
  machines at the home, office, or dorm room via the Internet.

• Instant access to knowledge through linked libraries and custom-
  designed search engines using personal agents that know your own
  preferences and needs.

• Delivery of university services such as health care using
  telemedicine. With our partner the Medical College of Georgia
  and a venture capital firm, we recently commercialized our
  electronic house call system, with a major customer already
  lined up.

2.   We must improve partnerships with industry, foundations,
     state and local governments and our sister institutions.

We all know that federal support for research has weakened, and while industry support has increased, it has shifted towards more short-term issues. All of us have to work together to find the solution that will allow us to maintain the diverse research program strength that laid the foundation for the robust economy we have today.......partnership is the key to survival for the research university. Collaborations such as is exemplified by the National Textile Center need to be more widespread.

Ultimately we have to find how we make our linkages to industry more robust by addressing issues related to intellectual property rights and university responsiveness to the global economy our business partners live and breath. Progress is being made in these areas and we need to communicate our successful practices to each other.

Universities should also look to collaborate in academic programs and not compete on each and every front. At Georgia Tech we are trying to take this to heart. Only this past year we created a joint Ph.D. program with Georgia State in public policy, and took a step into a new world by creating a fully integrated joint department of biomedical engineering with Emory University. This public/private partnership is unique, with Emory and Georgia Tech putting up shares of the faculty positions and resources.

3. In this same vein we have to include partnerships to address a growing need for continuing education and distance education. Currently, the average U.S. worker now switches jobs nine times in a career, and switches careers three times. In addition, according to a survey entitled, "What the Public Wants from Higher Education," 81 percent of surveyed Americans think that getting additional education is important for them to be successful at their place of employment.

Last year more than 17,000 working professionals participated in more than 900 Georgia Tech continuing education and distance learning courses. Many, did not once set foot on our campus. Our offerings have grown at a rate of 15% per year for the past two years and we believe this is just the tip of the iceberg. The supporting technologies are rapidly being improved, including on-line delivery using the Internet. As we speak our Governor has recommended funding of a $2 million

pilot for the University System of Georgia to develop a formal on-line learning network.

4.   We need to more aggressively pursue interdisciplinary research and teaching. This calls for us to align what we do in the research university more with what the world requires for solutions of its problems. For example, the issues associated with creating a sustainable society are not confined to one, or even a few disciplines, but rather cover a spectrum ranging from technical to policy areas. To address the challenges we need to be able to bring together faculties from various disciplines in teams in ways we have not done before. Incentives and design of physical space can encourage this until such time as it becomes natural.

5.   We need to do more than give lipservice to our interest in our undergraduates. This includes more attention focused on student life, including creating positive solutions for problems like binge drinking. It also calls for a re-connection of our faculty with our undergraduates. Human to human contact in a rich learning environment is one inherent advantage that residential institutions will always have over our growing virtual competition, and we better make sure it really exists!

6.   Finally, our survival depends on our suppliers. And, in order to continue to attract top-quality students to our universities, we need higher quality elementary, middle, and high school programs.

     Much of this improvement could come from enhanced interaction between higher education and secondary education. At Georgia Tech we are using telecommunications technologies to help. Examples include:

     Using distance learning technology to offer calculus classes to a group of high schools to help prepare their students for their college experiences.

     Teaming up with ZooAtlanta to enable students to learn about and monitor zoo animals' progress via the net--therefore encouraging students to both learn on their own and master computer skills.

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Conclusion

In conclusion, I have tried to illustrate the very real challenges that lie on the present course of the ship of state for our research universities. I have listed a few for your consideration, but there are more. Doing a little about them would be like "rearranging the deck chairs on the Titanic." Instead, research universities themselves, and those who are friends, are going to have to work hard and creatively to see to their survival.

For more than 100 years, research universities have played a dominant role in education and built reputations for excellence in academics and research. Today, we must build upon those reputations and be willing to lead the way to embrace the new technologies that will define both higher education and industry, as well as the world.

Thank you.